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 Véronique L. Roger

Myocardial infarction is a key component of the burden of cardiovascular disease. The assessment of the incidence and case fatality of myocardial infarction are important determinants of the decline in coronary disease mortality. The change in biomarkers used to diagnose myocardial infarction raises several methodologic, clinical, and public health challenges, which are discussed herein.

Pathophysiology of Acute Myocardial Infarction 553
 Allen P. Burke and Renu Virmani

More than 80% of acute myocardial infarcts are the result of coronary atherosclerosis with superimposed luminal thrombus. Uncommon causes of myocardial infarction include coronary spasm, coronary embolism, and thrombosis in nonatherosclerotic normal vessels. Additionally, concentric subendocardial necrosis may result from global ischemia and reperfusion in cases of prolonged cardiac arrest with resuscitation. Myocardial ischemia shares features with other types of myocyte necrosis, such as that caused by inflammation, but specific changes result from myocyte hypoxia that vary based on length of occlusion of the vessel, duration between occlusion and reperfusion, and presence of collateral circulation.

Vulnerable Plaque: Detection and Management 573
 Mario Gössl, Daniele Versari, Heike Hildebrandt,
 Dallit Mannheim, Monica L. Olson, Lilach O. Lerman,
 and Amir Lerman

Because most myocardial infarctions result from the rupture of a plaque that did not significantly compromise the coronary lumen

before the event, experts widely accept that the morphology, composition, and degree of inflammation of a coronary atherosclerotic plaque is more important than the degree of luminal stenosis. Two depicting examples are the concentric, calcified lesion that shows significant luminal stenosis but is stable because of the stabilizing clasp of calcification. In contrast, a smaller but inflamed thin fibrous cap atheroma with a big lipid/necrotic core may rupture and cause an immediate fatal coronary occlusion.

Risk Stratification Following Acute Myocardial Infarction

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Mandeep Singh

This article reviews the current risk assessment models available for patients presenting with myocardial infarction (MI). These practical tools enhance the health care provider's ability to rapidly and accurately assess patient risk from the event or revascularization therapy, and are of paramount importance in managing patients presenting with MI. This article highlights the models used for ST-elevation MI (STEMI) and non-ST elevation MI (NSTEMI) and provides an additional description of models used to assess risks after primary angioplasty (ie, angioplasty performed for STEMI).

Thrombolysis in Acute Myocardial Infarction: Current Status

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Thomas J. Kiernan and Bernard J. Gersh

ST-segment elevation myocardial infarction (STEMI) is still a major public health problem in the modern world. Therapeutic options have changed much over the last 20 years, with a shift in favor of mechanical reperfusion over pharmacologic reperfusion. Thrombolytic therapy still has much to offer in the management of STEMI, however, because many patients do not have timely access to a facility with the required expertise for establishing mechanical reperfusion. This review highlights the history of thrombolytic therapy, adjunctive therapies, the relationship with mechanical reperfusion, and potential roles for thrombolysis in the future.

Primary Percutaneous Coronary Intervention in Acute Myocardial Infarction

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Kanwar P. Singh and Robert A. Harrington

Primary percutaneous coronary intervention (PCI) has emerged as the preferred therapy for acute ST-segment elevation myocardial infarction (STEMI), as multiple randomized clinical trials and pooled analyses have shown improved clinical outcomes compared with medical reperfusion. Unfortunately, medical centers with 24-hour PCI capability are concentrated in urban areas, relegating many patients in the United States to inferior medical reperfusion. Ongoing substantial research efforts are directed at optimizing mechanical reperfusion, including refinements in adjuvant

medical therapy and the use of drug-eluting stents in the catheterization laboratory. Research efforts are also focusing on the implementation of streamlined transfer systems from community centers to tertiary care centers, akin to systems used in the trauma model. Furthermore, experience with the performance of primary PCI at community centers without onsite surgical backup is growing. This article summarizes data regarding the current state, challenges, and future directions of primary PCI for STEMI, emphasizing adherence to current American College of Cardiology/American Heart Association guidelines.

The Use of Biomarkers for the Evaluation and Treatment of Patients with Acute Coronary Syndromes

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Amy K. Saenger and Allan S. Jaffe

The advent of inexpensive, highly accurate, and predictive markers of myocardial injury, inflammation, and hemodynamic stability has revolutionized the evaluation and treatment of patients who have acute coronary syndromes (ACSs). These blood biomarkers require small sample volumes, can be run expeditiously, and provide important information concerning the diagnosis, risk stratification, and treatment of these patients. To understand the use of these markers, one must have some knowledge about what elevations in these markers imply, how they have to be collected and measured to provide reliable information, when to suspect analytic confounds, and what the key values are that impart the diagnostic, prognostic, and therapeutic information. This article discusses these issues, emphasizing what clinicians must know for optimal test use, and then addresses the practical use of these markers in patients who have ACS.

Management of non-ST-Segment Elevation Myocardial Infarction

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Stephen E. Van Horn, Jr., and Calin V. Maniu

Non-ST-segment elevation myocardial infarction (NSTEMI) is a major cause of cardiovascular morbidity and mortality in the United States. It represents the highest risk category of non-ST-segment elevation acute coronary syndromes (NSTEMI/ACS), for which timely diagnosis and appropriate therapy are paramount to improve outcomes. Evidence-based treatment, with combination of antiplatelet and anticoagulant therapy, and with serious consideration of early coronary angiography and revascularization along with anti-ischemic medical therapy, is the mainstay of management for NSTEMI. Aggressive risk-factor control after the acute event is imperative for secondary prevention of cardiovascular events. Applying in practice the American College of Cardiology/American Heart Association (ACC/AHA) guideline recommendations results in improved outcomes.

Pathophysiology of Cardiogenic Shock Complicating Acute Myocardial Infarction

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Eve D. Aymong, Krishnan Ramanathan, and Christopher E. Buller

Cardiogenic shock is a rapidly progressive, often fatal complication of acute myocardial infarction. A vicious circle of ischemia, decreased cardiac output and reinfarction progress to left ventricular failure and death. The fundamental pathophysiology of this cascade and other mechanisms beyond the classic paradigm of ischemia and dysfunction are discussed in detail.

Cardiogenic Shock: Treatment

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Zaza Iakobishvili and David Hasdai

The treatment of cardiogenic shock complicating the acute coronary syndromes consists of medical therapy, percutaneous revascularization procedures, cardiac surgery, and the implantation of devices. Medical therapy is limited to different positive inotropic and vasoactive drugs, without any firm evidence of survival benefit using these drugs. Several new pharmacologic compounds are at different stages of clinical research, but are not yet routinely approved for the treatment of cardiogenic shock. The only evidence-based therapy with proven survival benefit is timely revascularization. Intra-aortic balloon pump counterpulsation maintains its central role as supportive treatment in cardiogenic shock patients. Anecdotal evidence is available about the use of ventricular assist devices, cardiac resynchronization therapy, and emergent heart transplantation.

New Trials and Therapies for Acute Myocardial Infarction

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Richard J. Gumina

Acute coronary syndromes (ACSs), which include the clinical entities of unstable angina (UA), non-ST-segment elevation myocardial infarction (NSTEMI), and ST-segment elevation myocardial infarction (STEMI), account for more than 1.5 million hospital admissions annually in the United States alone. Approximately 1 million of these admissions are classified as UA/NSTEMI and approximately 500,000 are STEMI. Because of the overwhelming number of studies on ACSs over the past several years, this article focuses on new trials and therapies for treating patients diagnosed with STEMI.

Outcome and Quality of Care of Patients who have Acute Myocardial Infarction

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Wissam A. Jaber and David R. Holmes, Jr.

Coronary artery disease is the number-one killer in developed countries, with lifetime prevalence of up to 50% in American

men, and is the topic of much medical literature. Recently, multiple therapies have emerged to save lives after acute myocardial infarction (AMI), backed by well-conducted studies; however, appropriate implementation of therapy guidelines is less than optimal. Recent efforts have focused on improving the quality of care (QC) after AMI in order to improve outcomes. This article illustrates how outcome after AMI is related to QC, describes the underuse of evidence-based therapies, and discusses factors associated with poor guideline adherence. It also reviews current quality improvement projects, and some available means to measure and optimize the QC for patients with AMI.

Cell Therapy for Acute Myocardial Infarction

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Rajiv Gulati and Robert D. Simari

Evidence suggesting that bone marrow and circulating blood may harbor myocardial and vascular progenitor cells was the basis for pre-clinical studies of cell therapy for acute myocardial infarction (MI). Rapid initiation of clinical trials has since followed, with regional myocardial delivery of autologous cells being tested as adjunctive therapies for both acute and chronic left ventricular dysfunction. While clinical cell transplantation trials originally began with the explicit goal of myocardial regeneration, more recently the emphasis has shifted to attempted modulation of myocardial remodeling through other processes, such as mechanical strengthening of scar tissue and promotion of myocardial tissue survival through cellular paracrine effects. This article discusses the scientific rationale for cell therapy strategies in acute MI and provides an overview of the clinical studies that have been undertaken to date.

What the Future Holds for the Diagnosis and Management of Patients with Acute Myocardial Infarction

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David R. Holmes, Jr.

The care of patients with acute myocardial infarction has changed dramatically in concert with the expanding knowledge of the pathophysiology involved as well as the development of new pharmacologic and mechanical means of restoring flow. Important issues remain to be resolved, many of which have been explored in this book.

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